

# SWITCHING DC-TO-DC CONVERTER WITH MULTIPLE OUTPUT VOLTAGES

## Abstract

A switching DC-to-DC converter includes multiple power supply channels, coupled in parallel between a DC voltage source and ground, for converting the DC voltage source into multiple DC output voltages that are separate from each other. An oscillator outputs multiple oscillating signals to render each of the multiple power supply channels make at least one switching transition differently in the time domain from others of the multiple power supply channels, thereby improving transient noise. The multiple oscillating signals include two triangular wave signals with a phase difference of 180 degrees and two pulse wave signals with a phase difference of 180 degrees. Rising edges of the two pulse wave signals occur simultaneously with either a peak or a valley of the two triangular wave signals, respectively.